Crosby (A. B.)

A

LOST ART

IN

SURGERY,

BY

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d before the New York County Medical Society,—New Hampshire State Medical Society, and the White Mountain Medical Society.

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A LOST ART IN SURGERY.*

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It was the celebrated humorist, Charles Lamb, who said, on seeing a very dirty man, "If dirt were trumps, what hands you'd hold."

It must be confessed that man is a dirty animal; and if by reason of water he improves upon his natural state, he deserves commendation therefore. It is true that mere attrition will separate from the surface of the body its effete matter and its worn-out covering—and so man may be in possession of respectable health in spite of his filth. But when we approach the domain of the surgeon, we find that cleanliness is the *sine qua non* of successful surgery.

Filth in wounds means poison, and poison means death. The most extended observation has established the above statement as an aphorism in surgery. I do not hesitate to affirm that, in the great metropolitan hospitals of the world, cleanliness, in the highest and best sense, is almost unknown. I trust that I shall not be deemed impertinent when I assert that perfect cleanliness is a lost art in surgery.

To indicate the way in which this lost art may be restored is the object of the present paper. My method will be historical. I propose to adduce certain clinical facts which have come under my observation at

* This paper was read before the New York County Medical Society a year since, but its publication has been delayed until another year's experience in Bellevue Hospital might confirm its statements. A more extended observation has only reaffirmed its conclusions.

different times and in different places, and then deduce such inferences as these facts will seem to justify.

In the summer of 1861, being the first of our civil war, I was assigned as Division Surgeon to the staff of General Charles P. Stone, then commanding a corps of observation at Poolesville, Maryland. As we were thirty-six miles from Washington, and as the general hospitals in that city were at the time crude and unsatisfactory, I conceived the idea of establishing a Division Hospital on the ground, and so retain both our sick and wounded.

In August, 1861, I made a communication to Surgeon Charles A. Tripler, who was the Medical Director of the army at Washington, submitting my plan for the construction of a hospital, and asking for the necessary lumber, doors, windows, etc., with which to construct it. The plan was approved, my requisitions were endorsed, and the necessary materials furnished. Some enlisted men belonging to the 15th Massachusetts Volunteers, who were skilled carpenters, were detailed as builders, and on the 21st of October. the day on which the battle of Ball's Bluff took place, we were ready to receive the wounded from that ill-fated engagement.

This hospital was built essentially on what is now known as the pavilion plan, although I was at the time ignorant of the action which the Sanitary Commission was taking in the same direction. I have recently learned that the Sanitary Commission made a communication to the government in July, 1861, advocating the use of pavilion hospitals, and in October following—about the time my hospital was completed and occupied—secured an order for the construction of a hospital on the pavilion plan. I have given these details because from them it appears that my hospital was built and occupied before any of those suggested by the Sanitary Commission, and, so far as I know, was the first hospital of the kind erected during the war.

It consisted of a series of one story buildings, each large enough for a single ward of thirty beds. Each building was made of rough boards, the cracks being battened with strips, and all thoroughly white-washed, inside and out. There was a window at the head of each bed, suitable ventilators, which were always kept open, and a large stove in each ward. The kitchen and offices were in a building by themselves. All these buildings were connected by water sheds, without walls, so that each ward was distinct, and elevated walks were made beneath the sheds. The ground was elevated and dry, and as trenches were dug around each building to receive the droppings from the eaves, the drainage was

perfect. The sinks were at a distance from the hospital, fresh earth being thrown daily over the dejections.

The condition of the wounded brought off from Ball's Bluff was at the outset unfavorable. They were all suffering under the depression of defeat. It was necessary to transport the sufferers from the Virginia shore to Harrison's Island, in the Potomac, on scows, where they received immediate attention. As an attack was apprehended at daybreak, the wounded were again moved to the Maryland shore. Some of them were then pushed across the Ohio and Chesapeake Canal, while others were moved by canal boats to Edward's Ferry—but all were obliged to endure several miles of transportation by ambulance over exceptionally rough, rocky roads, the matter being complicated by a heavy rain.

On arriving at the Division Hospital at Poolesville, a uniform plan of treatment was adopted. The sum and substance of the plan was absolute cleanliness. This was enforced by frequent scourings of the wards, and the instant removal of dejections and all effete matter from them. The bedding was changed as often as it was in the slightest degree soiled. A rough wash-house was extemporized, where four men incessantly boiled, washed, and ironed the bedding. The patients bodies were sponged with warm water—those suffering with surgical fever at short intervals.

At that period of the war the common dressing for gunshot wounds was lint, held in place by adhesive strips, by which the wound was soon hermetically sealed, the retention of sloughing tissue and the burroughing of pus being thereby favored. This "whited sepulchre" method of dressing was absolutely interdicted. Every injury was treated as an open wound. A water dressing was applied, which was changed at short intervals, and burned as soon as soiled. All wounds which were offensive were treated with antiseptic and stimulating applications. No wound was drawn together until its surfaces were covered with bright, healthy granulations.

All our patients were fed for the first few days on the richest soups, fresh milk and bread, supplemented afterwards by a thoroughly nutritious mixed diet. The wards were flooded with sunshine and pure air. All these regulations were rigidly enforced, the nurses soon learning that the guard house and starvation were the penalties for any direliction. Thus absolute cleanliness, nutritious food, and pure air formed the tripod on which our Division Hospital at Poolesville rested, and to which its excellent results were mainly attributable.

Fortunately, I am inclined to think, our requisitions for drugs

remained unanswered, and we were obliged to content ourselves with a few pounds of copperas—a crude sulphate of iron—obtained at a country store, which, pulverized and mixed with molasses, answered admirably in cases where there was excessive suppuration. We had also opium, cinchona, Epsom salts, and whiskey.

Having thus summarized the history of this hospital, I shall as briefly summarize our results. The whole mortality, including those known to be mortally wounded on admission, and all cases in which operations were performed, both primary and secondary, as well as those where no operation was required, amounted to only ten per cent. Similar results have been attained with such a degree of uniformity in pavilion hospitals that many surgeons and sanitarians have been inclined to affirm that the old-time metropolitan hospitals cannot compete with them, and must therefore give place. It remains for us to see whether the position of these gentlemen is well taken.

The Third Surgical Division in Bellevue Hospital has had a remarkable history during the past eighteen months, which cannot fail to prove both suggestive and instructive. Prior to September, 1874, the four wards of this division were occupied by puerperal cases, and had become infected to such a frightful extent that the patients were all finally transferred to Pavilion Hospitals on Blackwell's Island. The records of the division during the last six months of its occupancy for lying-in purposes, show the following facts. My esteemed colleague, Prof. William T. Lusk, stated that from Jan. 1st to June 11th, 1874, inclusive, out of one hundred and sixty-six lying-in patients, there were thirty-one deaths. A large portion of the survivors suffered from chills, an elevated temperature, a frequent pulse, and abdominal tenderness. In June the patients were all transferred to Blackwell's Island. In September the infected wards were occupied by surgical cases. It was obvious that the puerperal epidemic had left the wards in an unsafe condition for the receipt of open wounds. Consequently, at the request of the commissioners, my colleague, Prof. Doremus, took charge of the disinfecting process. As the method of disinfecting large hospitals has generally been faulty, I take great pleasure in presenting the efficient course pursued in this instance. Under a recent date Dr. Doremus is kind enough to write as follows :

"In the Spring of 1875 the Commissioners of Charities and Corrections of this city requested me to disinfect the surgical wards in the North wing of Bellevue Hospital. In deciding what course to pursue I was influenced by the following considerations :

Although our knowledge of the products of human decomposition in various

diseases is exceedingly limited, we have reasons for believing that they are complex substances, and that hydrogen is one of their essential elements, the compounds of carbon with oxygen or with sulphur being excepted. On this theory, by attacking these emanations, with an element possessed of superior affinities for hydrogen, we can break up these compounds and thus rob them of their virulence. Moreover, as many of these poisonous bodies are gaseous, they are readily absorbed by porous substances, and thus, walls, ceilings, as well as the furniture of hospital wards become magazines of pestilence. To attack these evil spirits successfully, gas must meet gas. Chlorine gas seemed to fulfill these conditions, and as it is easily made and comparatively inexpensive, I determined to test the efficacy of large volumes of said element. It is well known that this gas has an intense affinity for hydrogen. When these two gases are mingled in a flask of colorless glass or collodion and exposed to the bright sunlight or to the electric light, they unite with explosive violence,—even in diffused daylight they unite rapidly, forming hydrochloric acid. Water saturated with chlorine will decompose when placed in the sunbeam ; its hydrogen associates with the chlorine, and oxygen gas is set free. When chlorine is presented to sulphureted hydrogen immediate decomposition of the ill odored gas takes place—the superior affinity of the chlorine for the hydrogen causes the sulphur to be deposited in fine, yellow particles, and the doubtful (egg) flavor disappears. If chlorine and arseniureted hydrogen are put together, hydrochloric acid is again formed, arsenic is deposited and this most poisonous gas is rendered inert. One of the lecture experiments at the Bellevue Medical College, is to displace a portion of water in a tall glass jar, with sulphuretted hydrogen gas over the pneumatic trough and another portion of the water with arseniureted hydrogen ; on passing up a few bubbles of chlorine, chemical action occurs ; the *yellow tersulphide of arsenic* is seen on the sides of the jar and on the surface of the water, owing to the abstraction of the hydrogen by the said chlorine and the releasing of the sulphur and the arsenic in the nascent state. When a paper saturated with oil of turpentine is placed in a jar of chlorine gas, black clouds of carbon appear, accompanied with a dull, red flame, because of the intense affinity of this electro-negative element for the hydrogen of the carbureted hydrogen vapor. The potency of chlorine as a bleaching agent, is doubtless due to its ability to abstract the hydrogen from the coloring principles, either directly or indirectly, by liberating active oxygen from water. In this bleaching process care has to be taken lest the tissue be destroyed ; as a rule, bleached goods have less strength than unbleached ones.

Many years since Faraday demonstrated that vaccine virus could be decomposed and thus deprived of its extraordinary powers by the agency of chloride. These few facts demonstrate that we understand the modus operandi of this deodorizing and disinfecting element. I refrain from mentioning others lest I prove tedious. Moisture is requisite in order that chlorine prove effective—although all substances contain more or less of water, I determined to fill each ward of the hospital with steam prior to charging it with chlorine. To check the loss of a portion of the gas, through crevices and other apertures, strips of paper were pasted around the windows and doors.

Some ten years ago, at the request of Prof. Lewis A. Sayre, Health Physician to this city, and of Mayor Gunther, with the co-operation of Dr. Swinburne,

Health Officer of the Port of New York, I undertook the disinfection of certain cholera ships. In employing chlorine as one of the purifying agents, I found sheets of lead were most convenient as receptacles for the chemicals used in generating this gas. I turned up an edge of about six inches, after rolling out several feet of the lead, and in these troughs placed the materials, such as the peroxide of manganese and hydrochloric acid, or common salt, manganese and sulphuric acid, I therefore used similar leaden troughs at Bellevue, in which I placed a mixture of peroxide of manganese, common salt, (chloride of sodium) and water, stirring the mass with wooden shovels.

Vessels of sulphuric acid (pots de chambre) were placed around said long troughs ; the floors of the wards were wetted ; steam was turned on until the walls and ceilings were thoroughly moistened, and with four or five assistants we groped our way through the cloudy atmosphere, applied the doses of acid and hastened out of the rooms, twenty-four hours later a second application of acid was made, after stirring the mixtures the wards were again closed for twenty-four hours, and in some instances the gas was allowed thirty-six hours of additional treatment. The windows were then thrown open ; the floors and walls were scrubbed and dried. This ended the purification.

To disinfect the water closets a mixture of about equal weights of manganate of soda and sulphate of magnesia (Epsom salts) was sprinkled in and around the basins at night. In the reaction of these salts the permanganate of soda is one of the products. The ozone liberated effectively deodorized and disinfected the water closets and the discharge pipes. Between two and three tons of chlorine gas were generated in disinfecting the aforesaid surgical wards. Two hundred pounds of the mixture of manganate of soda and sulphate of magnesia were used in the water closets.

Vive la Chimie !"

After this thorough disinfection by Dr. Doremus, my distinguished colleague, Dr. James R. Wood, took charge of these four wards, which now constitute the "Third Surgical Division." In the absence of Dr. Crane, one of the surgeons of this division, Dr. Wood has rendered the greater portion of the surgical service since September, 1874, and his results have been so exceptionally good that I have deemed it best to quote him directly with reference to the precautions which he instituted on occupying the wards. I am indebted to Dr. Wood, who writes as follows :

"Having chosen the third floor of the North wing of the hospital for my division, I determined, notwithstanding the wards having been used previously for the lying-in service, to prevent if possible the reappearance of any septic diseases. Wishing to begin under the most favorable of hygienic influences, I directed that all the straw in the beds in the wards should be burned, and the ticks should be well washed in carbolic acid. The bedsteads were also sprinkled and washed in the same material, and then painted. The floors were thoroughly saturated with carbolic

acid, and then scrubbed. The walls also were washed repeatedly with acid water and painted, in order to make the disinfection as complete as possible. Prof. Doremus was requested to generate immense quantities of chlorine gas in the wards, which was accomplished thoroughly. I then gave orders to my staff that under no circumstances should any case of erysipelas, cellulitis, gangrene, ulcers, or burns enter any of the wards. Should any of the above diseases enter the wards without the knowledge of the House Surgeon, he should, on becoming acquainted with the facts, immediately transfer the case to the Pavilion, and have the bed and bedding removed from the ward at once, and thoroughly washed and disinfected. I further ordered that no sponges should be used in the wards, and sheet lint and oakum be used in their places. Balsam Peru was ordered to be placed over wounds, and, in order to prevent the spread of disease by this means, it was decided that each patient should have a separate bottle of balsam, and that brushes should not be used more than once.

The House Surgeon and assistants were directed to take precautions to wash their hands and instruments in carbolized water after dressing unhealthy wounds, and the orderlies and nurses were ordered to keep the patients and beds perfectly clean, and to look after the thorough disinfection of the water closets daily. It was further directed that all wounds, especially amputations, should be irrigated several times daily with carbolic acid water and smeared with balsam Peru, the wounded part being placed on a pillow of oakum, in such a position that drainage should be perfect. Since the wards were occupied for surgical purposes, some eighteen months ago, so perfect have been the disinfective and sanitary regulations, that there has not been, during my service, a single case of pyemia, and only two cases of erysipelas, both occurring where cancerous tumors had been removed."

As I have the honor of being associated with Dr. Wood as one of the surgeons of this division, being at present on duty, I have taken great pains to carry out his suggestions. The results continue to be exceedingly satisfactory, not only in surgical cases where operations have been done, but in a class of compound comminuted fractures, with extensive laceration of the soft parts, which are generally regarded by surgeons as imperatively demanding amputation. In this connection I might quote several cases, the records of which I have, but I will not trespass on the patience of the Society at this time.

In view of the puerperal infection and the grave mortality that were present in these wards during the first half of 1874, I propose to bring

AMPUTATION

NO.	NAME	AGE	SEX	DISEASE	DATE OF OPERATION	LOCATION
1	L. H.	20	M.	Extensive Necrosis of femur of three years standing.	Jan. 23, 1875.	Middle 3d
2	L. D.	25	M.	Compound comminuted fracture of the femur, involving knee-joint.	Sep. 16, 1875.	Upper 3d

AMPUTATION

1	R. W.	45	F.	Comminuted fracture of leg, with compound dislocation of ankle-joint. Tibia resected nine months, resulting in a deformed and useless leg.	Oct. 2, 1875.	

AMPUTATION

1	E. K.	45	M.	Compo. fracture of leg, with extensive comminution of both bones.	Oct. 22, 1874.	Upper 3d
2	M M.	30	M.	Compound fracture of leg, with extensive laceration of soft parts.	Jan. 16, 1875.	Middle 3d
3	P. E	33	M.	Compound comminuted fracture of leg.	March 24, 1875.	Middle 3d
4	P. G.	40	M.	Compound dislocation of ankle.	March 24, 1875.	Lower 3d
5	A. M.	34	M.	Compound comminuted fracture of leg, involving ankle joint, together with rupture of anterior tibial artery.	Oct. 16, 1875.	Middle 3d
6	T. M.	12	M.	Compound fracture and dislocation of metatarsal bones.	Nov. 13, 1875.	Lower 3d
7	M. Q.	20	F.	Compound fracture of leg, with extensive laceration of soft parts.	Dec. 2, 1875.	Upper 3d
8	O. D.	34	M.	Compound comminuted fracture of leg.	Jan. 12, 1876.	Upper 3d

AMPUTATION

1	J. A.	32	M.	Necrosis of tarsal bones.	Oct. 10, 1874.	

OF THIGH.

METHOD OF OPERATING	RESULT	HIGHEST TEMP.	PULSE	TREATMENT AND REMARKS.
Lateral posterior flap.	Recovery	10th day, 102½	110	Closed for three days then opened. Ligature away on 10th day. No erysipelas.
Lateral Skin flap	Recovery	11th day, 103	108	Ligature away on 20th day. No erysipelas. Small slough on inner flap due to contusion of soft parts. Openly. Irrigation and balsam.

OF KNEE-JOINT.

Lateral skin flap. Patella remaining.	Recovery	4th day, 102½	106	Ligatures away on 19th day. No erysipelas. No abscess. Openly. Irrigation and balsam.

OF LEG.

Lateral skin flap.	Recovery	3d day, 103½	112	Ligatures away on 20th day. Openly. Irrigation and balsam.
Circular, with lateral incisions.	Recovery	19th day, 102½	94	Ligatures away on 19th day. Small abscess on spine of tibia. Openly. Irrigation and balsam.
Lateral skin flap.	Recovery	2d day, 103	144	No abscess. Openly. Irrigation and balsam.
Lateral skin flap.	Recovery	29th day, 106½	120	Chill. Abscess over tibia. Closed for a few days, then reopened. Irrigation and balsam after opening.
Lateral skin flaps.	Recovery	6th day, 102½	124	Ligatures away on 14th day. No abscess. No erysipelas. Openly. Irrigation and balsam.
Lateral skin flaps.	Recovery	3d day, 101½	124	Ligatures away on 9th day. No abscess. No erysipelas. Openly. Irrigation and balsam.
Lateral skin flaps.	Recovery	5th day, 102½	114	Ligatures away on 8th day. No abscess. No erysipelas. Openly. Irrigation and balsam.
Lateral skin flap.	Recovery	3d day, 102½	140	No erysipelas. Small abscess. Openly. Irrigation and balsam.

AT ANKLE-JOINT.

Syme's.	Recovery	3d day, 101½	120	Stump was closed. Small abscess and slight sloughing.

AMPUTATION

NO.	NAME	AGE	SEX	DISEASE.	DATE OF OPERATION.	LOCATION.
1	J. H.	15	M.	Lacerated wound of foot, with compound dislocation of first phalanx of great toe. Plantar surface extensively torn up.	June 9, 1875.	
2	J. M.	27	M.	Lacerated wound of foot, with dislocation of first metatarsal bone. Comminution of Phalanges. Plantar surface extensively torn up.	Jan. 11, 1876.	

AMPUTATION

1	J. G.	28	M.	Compound comminuted fracture of fore-arm, involving elbow-joint.	March 29, 1875.	Middle 3d

AMPUTATION

1	J. K.	22	M.	Lacerated wound of hand, requiring removal of 2, 3, 4, 5 fingers.	Dec. 19, 1874.	
2	J. D.	13	M.	Lacerated wound of hand, requiring amputation of all the fingers through middle of metacorpus.	June 3, 1875.	
3	T. B.	12	M.	Lacerated wound of hand, requiring amputation of 4th and 5th fingers at carpo-metacarpal articulation.	July 5, 1875.	

RADICAL CURE

1	R. G.	61	M.	Oblique inguinal.	Dec. 5, 1874.	Right side
2	R. C.	60	M.	Oblique inguinal.	Feb. 13, 1875.	Left side
3	C. I.	40	M.	Oblique inguinal.	Feb. 13, 1875.	Left side
4	M. B.	28	M.	Oblique inguinal.	Oct. 30, 1875.	Left side
5	J. K.	30	M.	Oblique inguinal.	Nov. 20, 1875.	Left side
6	J. H.	27	M.	Oblique inguinal.	Nov. 20, 1875.	Right side
7	J. D.	52	M.	Oblique inguinal.	April, 1876.	Left side

OF TOES.

METHOD OF OPERATING	RESULT	HIGHEST TEMP.	PULSE	TREATMENT AND REMARKS
	Recovery			Abdominal decubitus for drainage Irrigation, balsam and oakum.
	Recovery	2d day, 102		No Erysipelas. No Abscess. Abdominal decubitus. Irrigation, balsam and oakum.

OF ARM.

Lateral skin flap.	Recovery	2d day, 102½	120	No erysipelas, abscess or sloughing. Open. Irrigation and balsam.

OF FINGERS.

	Recovery	5th day, 101 1-5		Slight erysipelas on 7th day. Balsam and oakum dressing.
Palmar flap.	Recovery	Normal		Openly. Balsam and oakum dressing. No erysipelas, abscess or sloughing.
	Recovery			Slight erysipelas on 12th day. Small abscess opened on 14th day. Balsam and oakum dressing.

OF HERNIA.

Seton wet in subsulphate of iron.	Recovery	4th day, 100½		No peritonitis. Opium.
Wutzer's.	Recovery	4th day, 99½	80	No peritonitis. Opium.
Seton wet in subsulphate of iron.	Recovery			No peritonitis. Opium.
Wutzer's.	Recovery	2d day, 100		No peritonitis. Opium.
Wutzer's.	Recovery	8th day, 103		No peritonitis. Opium.
Seton wet in subsulphate of iron.	Recovery	7th day, 103		No peritonitis. Opium.
Agnew's.	Recovery	6th day, 100 1-6	76	No peritonitis. Opium.

STRANGULATED

NO.	NAME	AGE	SEX	DISEASE.	DATE OF OPERATION.	LOCATION
1	T. L.	37	M.	Oblique inguinal. 20 years' standing.	Dec. 3, 1874.	Right side
2	J. P.	47	M.	Oblique inguinal. 8 years' standing.	Dec. 7, 1874.	Right side
3	C. T.	40	M.	Oblique inguinal.	Sept. 2, 1874.	Right side
4	S. R.	37	M.	Congenital.	Sept. 13, 1875.	Left side

AMPUTATION

1	K. D.	40	F.	Schirrus cancer.	Oct. 10, 1874.	Right side
2	M. C.	38	F.	Schirrus cancer.	Oct. 31, 1874.	Right side
3	E. F.	47	F.	Schirrus cancer.	Nov. 6, 1875.	Left side
4	S. C.	55	F.	Schirrus cancer.	Nov. 13, 1875.	Right side
5	K. C.	30	F.	Schirrus cancer.	Jan. 2, 1876.	Right side
6	D. B.	44	F.	Schirrus cancer.	March 11, 1876.	Left side
7	K. T.	17	F.	Fibro sarcoma benign.	March 28, 1876.	Left side
8	M. C.	39	F.	Schirrus cancer.	April 13, 1876.	Right side

HERNIA.

METHOD OF OPERATING.	RESULT	HIGHEST TEMP.	PULSE	TREATMENT AND REMARKS.
Sac not opened.	Died	12th day, 100 1-8	96	Signs of strangulation had existed for several days before admission. Abscess. Artificial anus. Patient died of exhaustion two months after operation.
Sac opened.	Died	6th day, 101½	100	Complete strangulation of 24 hours' standing. Abdomen tender and tympanitic on admission. Died 8th day of peritonitis.
Sac opened.	Died			Strangulation of two days duration. Marked peritonitis on admission. The gut was gangrenous, became ruptured, and was not reduced. Died two days after operation.
Sac opened.	Died	3d day, 104		Strangulation of 10 hours' duration. Died on 17th day of acute uræmia. External wound healed, and internal abdominal ring completely closed. No peritonitis.

OF BREAST.

	Died			Erysipelas invaded the wound on the 10th day, and gradually extended until the arm and back were involved. An abscess in the axilla was opened on the 11th day, and on the 4th of Nov. diarrhœa set in, which resisted all treatment. Patient died of exhaustion. Patient was removed to a medical ward.
	Recovery			No erysipelas.
	Recovery	3d day, 101 1-5	96	No erysipelas.
	Recovery			No erysipelas.
	Recovery	2d day, 102 1-4	112	No erysipelas.
	Recovery	2d day, 101	112	No erysipelas.
	Recovery	3d day, 101	86	No erysipelas.
	Recovery	3d day, 101	112	No erysipelas.

TREPH

NO.	NAME	AGE	SEX	DISEASE.	DATE OF OPERATION	LOCATION
1	J. P.	47	M.	Comp. com. fracture of frontal bone.	Dec. 3, 1874.	Right side
2	F. R.	9	M.	Comp. depressed fracture of frontal bone.	Jan. 5, 1875.	Right side
3	A. G.	16	M.	Pistol shot wound. Parietal bone.	July 1, 1875.	Right side
4	J. R.	34	M.	Comp. depressed fracture of parietal bone. Base of skull involved in fracture.	Nov. 17, 1875	Left side
5	A. S.	50	M.	Comp. com. depressed fracture of frontal bone, and fracture of base.	March 4, 1876.	Right side
6	A. L.	5	F.	Pistol shot wound of frontal bone.	Aug. 7, 1875.	Right side
7	J. P.	50	M.	Syphilitic necrosis of parietal bone.	Nov. 21, 1875.	Right side

EXTERNAL PERINEAL

1	W. H.	34	M.	Stricture of urethra. Perineum infiltrated. Bladder greatly distended.	Feb. 26, 1875.	
2	W. C.	20	M.	Tight stricture of urethra, complicated with fistula.	Dec. 11, 1875.	
3			M.	Tight stricture of urethra.	Dec. 11, 1875.	

INING.

METHOD OF OPERATING	RESULT	HIGHEST TEMP.	PULSE	TREATMENT AND REMARKS.
	Died			Hemorrhage from nose. Severe shock. Fragments elevated and removed. Patient never rallied. Died 20 hours after.
	Recovery	5th day, 107	108	Membranes not injured. Fragments elevated and removed. Out of bed on 24th day. No meningitis.
	Died	12th day, 105½	135	Membranes and cerebral tissue lacerated. Meningitis began on 5th day. Hernia cerebri appeared within 6 days. Died 14th day.
	Died	8th day, 103	96	Membranes not lacerated. Meningitis 20th day. Softening. Died 41 days after operation.
	Died	2d day, 107		Hemorrhage from nose. Cerebral tissue lost. Died 2d day.
	Recovery	105	160	Slight shock. Fragments removed at a depth of 1 inch. 3 drachms of brain tissue lost. Ball probed for at depth of 2½ ins.; not found. Hemiplegia appeared on 21st day. Hernia appeared on 10th day; increased for 3 months; then, under use of permanganate of potash for 2 months disappeared. 19th day sanious discharge from patient's ear.
	Died	2d day, 103	120	Necrosed portion removed by an elevator. Hemiplegia 8th day. Died 11th day. Meningitis and cerebral abscess.

URETHOTOMY.

Without a guide.	Died			No instrument could be introduced into the bladder. Patient died 6 days after of peritonitis, Post mortem revealed extensive infiltration under parietal layer of peritoneum.
With a guide.	Recovery	3d day, 103½		No catheter introduced to keep urethra open. Sounds introduced after 2d day. No erysipelas or abscess. When discharged patient passed a good stream.
With a guide.	Died			Wound closed. Patient was attacked within 24 hours after operation with acute œdema and congestion of lungs. Post mortem revealed fatty degeneration of heart.

NASAL

NO.	NAME	AGE	SEX	DISEASE	DATE OF OPERATION	LOCATION
1	W. A.	22	M.	Nasal polypus, involving antrum and nasal cavity; projecting through anterior nares in front, and pressing down the velum pendulum palati behind.	Jan. 23, 1876.	Right side

EXCISION

1	F. S.	17	M.	Necrosis of fibula.	Jan 22, 1876.	Right side

LITHO

1	T. P.	55	M.	Stone in bladder.	Oct. 13. 1874.	Bidateral

REMOVAL OF

1	R. W.	45	M.	Cancer of inferior maxilla.	Oct. 17, 1874.	Right side

RESEC

1	S. J.	21	F.	Caries of elbow-joint.	May 28, 1875.	Right side
2	J. W.	29	M.	Caries of knee-joint.	Oct. 9, 1875.	Right side

POLYPUS.

METHOD OF OPERATING.	RESULT	HIGHEST TEMP.	PULSE	TREATMENT AND REMARKS
	Recovery	2d day, $102\frac{3}{4}$	110	Had been removed from antrum once before. The tumor was torn from cribriform plate of ethmoid bone, and liq. ferri subsulphatis applied daily to raw surface until April 1, when he was discharged cured.

OF FIBULA.

	Recovery	2d day, $102\frac{1}{2}$		The thickened periosteum was elevated, and the entire fibula removed, except the head and malleolus. Wound was dressed with lint and balsam. Patient was discharged the middle of April with a new fibula.

TOMY.

	Died			Small amount of blood lost. Reacted well. Died 30 hours after operation of acute uremia. Post mortem revealed acute and chronic diffuse nephritis, with extensive cystic degeneration.

INFERIOR MAXILLA.

	Died	2d day, $102\frac{3}{4}$		Difficulty of breathing 7th day. Laryngotomy. Extensive erysipelas set in on 10th day, and patient died of exhaustion 14 days after operation.

TIONS.

	Recovery	2d day, $103\frac{1}{4}$	104	The exsection was sub-periosteal. The articular surfaces were removed, and the wound allowed to remain open. Went to garden 18th day. No erysipelas. Patient has almost perfect use of elbow.
Anterior flap. Patella left.	Recovery	10th day, 103	120	No erysipelas. Patient was walking with a posterior splint 10 months after the operation.

out in contrast the surgical results obtained in the same wards since September, 1874. My House Surgeon, Dr. H. M. Silver, whom I especially desire to commend for his efficient and conscientious discharge of duty, has, at my request, tabulated, from the reports of the division, a history of the surgical cases in which operations have been done since the disinfection of the wards and the establishment of absolute cleanliness, and the results of the same.

From this table it appears there were two amputations of the thigh high up, both of which recovered. The average temperature was 102⅜; pulse, 110. No abscess or erysipelas appeared in either case. One was treated openly, and the other in the same way after the first two days. There was an amputation at the knee-joint that had little more disturbance than a simple amputation of a finger. The highest temperature was 102½; pulse, 106; no erysipelas, no abscess, and the patient made a rapid recovery. There were eight cases of amputation of the leg, all of which recovered. They were all treated openly, except one in which the temperature was up to 106½; the average temperature was 103¾. In only two cases did abscesses form, and they were very small. No erysipelas occurred in any of the stumps. There were two amputations of the toes, with extensive laceration of the plantar surface of the foot. There was little or no constitutional disturbance, the drainage being perfect, and recovery rapid. There was one amputation of the arm, followed by recovery. The temperature was 102½; pulse, 120; but no erysipelas, abscess, nor sloughing. There were three cases of amputation of several fingers, involving either the carpus or metacarpus, all of which recovered without constitutional disturbance. Thus it appears there were seventeen consecutive amputations, twelve major and five minor, *all* of which recovered. These results are most encouraging when we contrast them with the statistics of mortality of Sir James Y. Simpson, as derived from a record of five thousand amputations.

The table further shows that there were seven operations for the radical cure of hernia, all of which recovered. There was no peritonitis in these cases, and all were treated with opium. There were four operations for strangulated hernia. Three of the cases had peritonitis when admitted, and all died within a few days. The fourth case recovered from the hernia, but died subsequently from uraemia.

There were eight amputations of the breast. Seven recovered with slight disturbance; the remaining one died from erysipelas and exhaustion. There were seven cases of trephining. Two recovered; five died from meningitis, and were suffering from compression on admission.

There were three cases of external perineal urethrotomy. One recovered, two died: one from extensive urinary infiltration, and the other from acute œdema and congestion of the lungs. There was an operation for the removal of the superior maxilla, and one for the excision of the fibula, both of which recovered with low temperature. There was a case of lithotomy which died of acute uræmia thirty hours after the operation, and an operation for the removal of the inferior maxilla, which died from erysipelas. Finally there were two resections—one of the knee and one of the elbow—both of which recovered, the temperature not going above 103.

From the foregoing results it appears that sepsis has gained no habitat in these wards since they were disinfected, and since absolute cleanliness has been enforced.

In addition to these cases under the service of Dr. Wood, I have added an amputation in the upper third of the thigh, a radical operation for hernia, and a range of compound injuries, all of which have recovered.

But I am able to adduce still further evidence, derived from another quarter, but showing the same facts. In the Long Island College Hospital, of which I formerly had the honor of being one of the surgeons, the surgical wards became infected, and the history of the infection, together with its removal, is, to my mind, extremely significant. My friend and former colleague, Professor Jarvis S. Wight, at my request, has kindly furnished me the following statement. He writes:

"During the spring of 1873 pyemia and septicemia prevailed in the Long Island College Hospital. I was requested to disinfect the surgical wards. The following plan was submitted to and approved by the committee and carried out under my personal supervision, viz.: Some of the bedding and appliances was burned, while the rest was thoroughly washed in a strong solution of crude carbolic acid. The floors and walls of the ward were washed with the same carbolic solution, and then the wards were fumigated for three days with the vapor of carbolic acid and vinegar, and after that fully ventilated. When the patients were put into the ward again, pyemia and septicemia continued.

"Later in the season I came on duty in the surgical wards, and found pyemia and septicemia still prevailing. I said to myself, what can I do to eradicate this great trouble? I remembered the things that had been done, and then thought of the things that had not been done, and found I had overlooked the surgeon, the interne, the nurse and the patient; and for the first time realized that I had used an antiseptic instead of a disinfectant. I had preserved the proto-mycete and not destroyed it.

"Now remembering the well known affinity of chlorine for the hydrogen of infection and sepsis, I procured a bottle of chlorinated soda and washed my hands in it; then instructed the interne to do the same thing. The nurses were ordered to wash their hands in a solution of chlorinated soda both before and after dressing each wound. The wounds were washed with a weak solution of chlorine, and lightly dressed with sweet oil or carbolized oil, or at times with a little oakum. The *hands* of the *surgeon*, the *interne* and the *nurses* were *kept clean*. *Clean* hands, *clean* wounds, *clean* sponges, *clean* dressings, and *clean everything* were the order of the day. Disinfection and cleanliness were scrupulously observed before, during, and after operations.

"In two weeks' time there was a marked diminution of infection and sepsis, and in little more time it was the remarkable result that the foe had gone to parts unknown, and has never returned, for from that day to this a bottle of liquor sodae chlorinatae stands upon the table of each surgical ward, ready for constant and daily use, a standing monument over the grave of proto-mycete.

"I often think of what I did to banish pyemia and septicemia, and how I failed; and I also think of what more I did, and am gratified by the remarkable results. And now will it turn out, after all the agitation, that tents are no better than large hospitals well provided with sunlight, fresh air, disinfection and cleanliness? Of a truth wisdom is a tardy guest."

Such facts as these plead with mute eloquence for the restoration to surgery of the lost art of *absolute cleanliness*. It is not enough that the ward and bed are clean, but, in the language of Prof. Wight, we must have 'clean everything.'

Prof. Lusk, who observed the puerperal epidemic at Bellevue, was of the opinion that the transmission of the disease was through the attendants. I am aware that some may aver that puerperal fever can not be eradicated from wards once infected. Dr. Lusk, in an admirable paper entitled "The Genesis of an Epidemic of Puerperal Fever," has given a summary of the labors of Winckel in the lying-in institution of Dresden, which shows conclusively that *absolute* cleanliness may even here be king. In writing of this institution Dr. Lusk says:

"In the year 1872 there were 991 confinements and 52 deaths., a rate somewhat exceeding 5 per cent. During the first nine months the death rate was 6.5 per cent, whereas it fell in the succeeding three months to 2.8 per cent. This favorable change was not due to the workings of a special grace, but to the energetic measures inaugurated by Winckel,

who assumed the control in October, 1872. These measures were in substance as follows: The locality of the confinement ward was changed. Every patient was continued upon the bed in which she was confined. When removed to an adjoining ward the bed was transported with her. Each ward containing puerperal patients was emptied once a year, and kept vacated from three to four weeks. A distant wing of the hospital was set apart for erysipelatous and other cases requiring to be separated from those who were in a normal state. An additional nurse relieved the midwife in attendance upon confinement cases from all charge of the puerperal patients. To determine the carriers of infection, only one female pupil at a time was allowed to take charge of the confinements. So soon as a single case of fever occurred among the patients delivered by her, she was at once prevented from examining either pregnant or parturient women. Similar regulations were enforced in the case of the medical attendants.

"In the year 1873 the month of January began badly. From the 1st to the 9th inclusive 26 patients were confined. All without exception were taken ill, and five, or 19 per cent., died. This formidable state of affairs was coincident with a change in the staff of nurses; whereupon the following additional orders were issued: Examinations of parturient women to be forbidden to all those who had previously been in the habit of making them. Removal of the midwife in charge of the labor cases. The pupils and midwives were forbidden to wash the genitalia of puerperal women, but the latter were compelled to perform their own ablutions. All the instruments and apparatus in the lying-in ward were either destroyed or subjected to a white heat. Each patient was provided with her own catheter and injection tube. The temperatures were taken in the axilla in place of the vagina. The ulcerations about the vulva and vagina were touched with the liq. fer. perchlorid. This duty was performed by Winckel himself.

"As a result of the enforcement of these rules, from the 16th of January to the 7th of July, out of 510 births there were but 3 deaths. But of these three one was due to rupture of the uterus, one to nephritis, and one only, or 0.2 per cent., took place from metria, a result scarcely possible in a similar number of confinements among the poorer classes in their homes."

These facts and others which I have quoted are extremely significant, and need little from me in the way of comment. It will be observed that I have dealt only with well established clinical facts. Concerning the germ theory of Pasteur, the doctrine of microscopic fungi and algae,

the micrococcic, the bacterian and coccoglian hypotheses, together with the proto-mycetian ghoul—concerning all these I have held my peace. Not that these various ingenious theories do not possess a transcendental sweetness for the scientific mind, but because there are those who disbelieve them. But however we may dispute in regard to the genesis of sepsis, the clinical facts which I have adduced conclusively prove certain propositions.

First.—Theoretically and in the vast majority of cases *de facto* sepsis can be prevented by an absolute and comprehensive attention to the laws of cleanliness.

Second.—Given that sepsis has occurred in a given case, absolute cleanliness will prevent its extension to other cases, and will stamp it out. Cleanliness is then the lost art which we are to restore to surgery. The success of Mr. Lister with his so called antiseptic method is known the world over. But all observers agree that Mr. Lister's method, independent of carbolic acid, involves an attention to the details of cleanliness almost miraculous, and his results correspond. In fact, Mr. Lister's method has been adopted by others with a substitution of pure water in the place of carbolic acid, and again God-given cleanliness has won the crown. I think then I am justified in saying that sepsis in a hospital is a crime. And as one bad man in a neighborhood may infect many others, so a little leaven of sepsis in a ward will soon leaven the whole lump. And as the statute law demands the execution of the criminal, so the sanitary law demands the destruction of the septic poison. The statute law is designed and undoubtedly does repress crime, and so sanitary law is especially valuable in the way of prophylaxis.

An observance of all the laws of absolute cleanliness about wounds is the great prophylactic against sepsis. Carbolic acid, used in a weak form freely, certainly possesses a remarkable power in preventing putrefactive changes, but putrefaction once having occurred, it is far inferior to permanganate of potash, the chlorinated washes, and other agents, which by rapid chemical changes, immediately destroy both poison and odor.

Sanitarians have been disappointed that hitherto the thorough disinfection of wards and beds has not stayed the fatal course of sepsis. But these gentlemen have overlooked the fact that such disinfection is only one product among many that go to make up the sum of absolute cleanliness. This, together with thorough disinfection of nurses, internes, surgeons, and all appliances about the patient, form a chain which is worthless if one link is missing. I esteem the disinfection of wards and

beds of the utmost importance, but they are useless if all other details of cleanliness are not enforced at the same time.

Dr. Doremus disinfected all the wards at Bellevue with chlorine, but, aside from the Third Surgical Division, I cannot learn that any extraordinary precautions with reference to cleanliness were at the same time enjoined. I have verbally interrogated the distinguished surgeons who are serving at present on the other divisions as to whether the mortality has been greater or less than before the disinfection. Without reference to the written records of the hospital, these gentlemen have given me their general impressions. Dr. Sands says he thinks the mortality has on the whole been less, although he is not certain, as there have been as many cases of as grave a type as before. Dr. Mason makes essentially the same statement as Dr. Sands. Dr. Hamilton does not admit that his wards have ever been infected, and has observed no material changes in the mortality of his cases.

These statements are of comparatively negative value, for the most intelligent experience goes to show that clean wards and clean beds, desirable as they are, are not alone sufficient to insure the best surgical results. We are beginning to learn that "evil communications" corrupt good surgery. Every possible channel of conveyance from one wound to another must be hermetically sealed, or "original sin" will certainly crop out.

In the early part of this paper I referred to my own most satisfactory results in connection with a pavilion hospital, and the advocates of this form of hospital claim that it should take the place of large hospitals. I admit that the pavilion is inexpensive, is isolated, can be destroyed when infected, and gives excellent results. Now I suspect that these results are largely due to the fact that a singel ward building is more likely to be kept absolutely clean than a great hospital, just as a single room shanty can be kept thoroughly clean much easier than a palace. But when the advocates of the pavilion plan assert that great metropolitan hospitals must inevitably in time become charged with the poison of pyemia and septicemia, beyond the possibility of relief, save by fire or tearing down the structure, they take a position which the facts cited in this paper show to be false.

I do not hesitate to affirm that any old infected hospital can be entirely disinfected, that there can be no crevice or interstice in such a structure in which septic poison lurks which may not be dislodged and destroyed by being brought in contact with a suitable chemical agent. To generate chlorine in saucers in such wards, or simply to hang up

napkins wet in disinfectants, is about as efficient as the Pope's bull against the comet. But if chlorine is generated on the scale practiced by Dr. Doremus at Bellevue, in wards tightly closed for some days, the immense volume of gas and its expansive force will cause it to permeate every crack and crevice beyond the limits of any poison lodged therein. When we come to the disinfection of wards we want not a shower, but a deluge.

But if this lost art of cleanliness is to be restored, how is it to be accomplished? The moral accountability for the disastrous results likely to follow the want of cleanly precautions in wards, seems to me to rest on the surgeon himself. It is for him, reverently realizing the functions of his high office, to point out the way. To accomplish the desired end, the exact duties in this regard, of surgeons, internes and nurses should be definitely enjoined. The surgeon should then hold his interne to a rigid daily accountability, and he in turn should narrowly watch the nurses. All causes for complaint of neglected duties to be instantly reported to the surgeon, and if not within his province to correct, to be reported by him to the hospital authorities. These details have seemed to me so absolutely essential, that I think they should be printed on cards which should be nailed on every door in the wards, and a copy furnished to every attendant connected with the ward for his instruction and guidance. As, however, the sum of these regulations has been expressed, I shall not weary the Society with them, simply adding that I have divided them into four sections.

First.—Regulations to be observed by all persons in common having any official connection with the ward.

Second.—Regulations for the guidance of internes.

Third.—Regulations for the guidance of nurses.

Fourth.—Regulations with reference to general cleanlines, designed for the head of the hospital.

And so finally we have reaffirmed the adage that "cleanliness is next to Godliness," and this, too, in the largest and best sense is *health*.

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